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ABSTRACT

This booklet provides step-by-step instructions for designing and constructing simple, individually tailored adaptive mobility devices for preschool-age children who are visually impaired. These devices are intended to enable children to begin to master independent travel, which precedes long cane training. How to introduce the mobility device to children, why an adaptive mobility device is needed, how to determine the appropriate device, and typical sequencing and device transition are discussed. Four different types of devices are then introduced: the Moveabout (with three different design options), the Pusher, the L-Bar, and the Arc-Definer. Instructions about each device include a list of the materials and tools needed to construct the device, the cost of materials and tools, optional features, and construction directions. Information is also provided on how to individualize devices to fit the height and width of the child, and photographs and diagrams show the assembly process. Three case studies of children (ages 1-2) with visual impairments illustrate the use of the devices. (Contains 19 references.) (CR)

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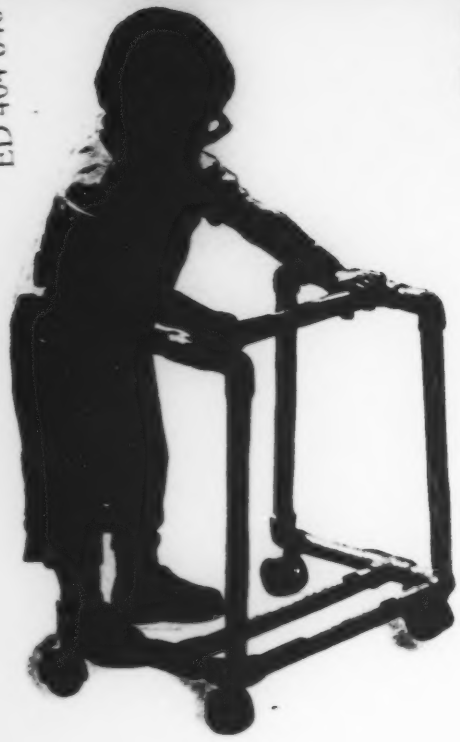
STANDING ON MY OWN TWO FEET



A step-by-step guide to designing & constructing simple, individually tailored adaptive mobility devices for preschool-age children who are visually impaired

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

STANDING ON MY OWN TWO FEET

A step-by-step guide to designing & constructing simple, individually tailored adaptive mobility devices for preschool-age children who are visually impaired

by

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Los Angeles, California

STANDING ON MY OWN TWO FEET
A step-by-step guide to designing and constructing simple, individually tailored adaptive mobility devices for preschool-age children who are visually impaired

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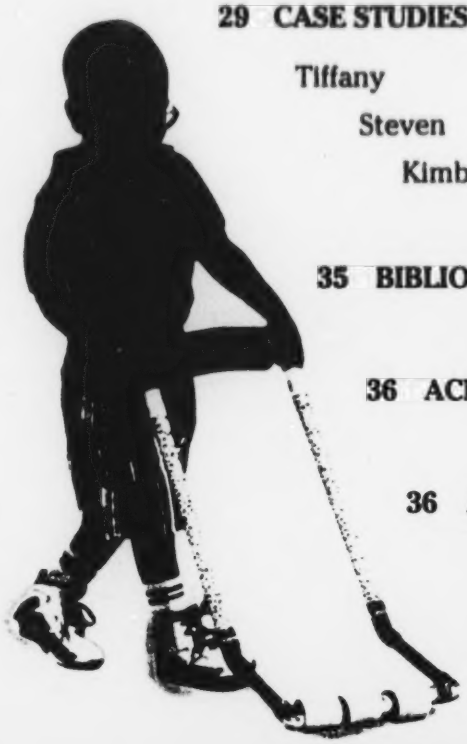


One of the greatest joys I have experienced as an orientation and mobility specialist is empowering preschool-age children who are blind and visually impaired with the opportunity and skills that will allow them to negotiate their environment skillfully and confidently. Indeed, success in this endeavor will help ensure that these youngsters develop a healthy sense of self over the course of a lifetime as they grow into independent youths and adults. I have used—and continue to use—devices developed by other professionals. Clearly, these devices have paved the way for this publication. However, few devices exist to facilitate this process which are both personalized enough to meet the special movement needs of individual children, *and* economically accessible to most parents, schools, and other care providers. I wish to acknowledge and thank those who have made the scores of contributions that have made this work possible.

This booklet was developed to meet this need, by providing a step-by-step guide to designing and constructing simple, individually tailored adaptive mobility devices made from low-cost polyvinylchloride (PVC) materials. These devices are intended to enable preschool-age children who are blind to begin to master independent travel, which for many youngsters will precede long cane training, as appropriate. A number of the instructions for the devices which this booklet describes evolved from examining and analyzing the effectiveness of existing devices. This includes devices which I have found to be of great use, and those which have not proven to be *effective*. My goal is to help you create devices that address and meet the specific needs of each child with whom you work.

Children require opportunities for exploration to promote good health. Standing and walking helps keep their muscles flexible and bones strong, and aids in other bodily functions and requirements. It helps maintain their cardiovascular and respiratory systems and provides an outlet for their energy. Children who are always sitting, or otherwise passively participating, will ultimately jeopardize their health. In addition, development areas such as cognitive, language and communication, and social-emotional growth are enhanced when students participate in mobile activities.

With few exceptions, I have found that children like their devices and are proud about using them, both during and outside the orientation and mobility (O&M) lesson. This should come as no surprise, as they afford the child the ability to move about freely and competently. At the Blind Childrens Center, I introduce each new student to the device I have constructed for him by letting him casually happen upon it during a play session. Then I show him what he can do with it, for instance: "It can find things for you," or "It protects you from getting bumped." I have found that if he comes to feel in control of the situation and is able to find toys and other things he likes—with appropriately interjected guidance, of course!—it is more probable that he will value the device. To help reach this objective, I make sure that the first few lessons are simply semi-structured play times. In this context, I may point out to the child that he didn't bump his head, or talk about

1

what a great toy he was able to find, or how he was able to travel to the playground all by himself. As soon as he has become somewhat familiar with and proficient in using the device, my lessons focus on helping the child learn how to use his device safely and appropriately. This increases the probability that he will be able and willing to use the device outside of the O&M lesson. It then becomes part of his everyday routine. The device generates **independence** which generates positive **self-esteem** which generates increased **independence** which

Development areas such as cognitive, language and communication, and social-emotional growth are enhanced when students participate in mobile activities.

generates **success** in O&M which generates **success** in all other developmental areas.

THE LONG CANE AND PRESCHOOL-AGE CHILDREN

The Blind Childrens Center is a strong supporter of preschool-age children as long cane users. Our goal is to prepare students for the long cane, and this booklet is designed to facilitate that process.

Although the use of the long cane for many preschool-age children is appropriate, it is not always suited as a mobility device for every child in this age group. If the long cane is an appropriate device, then by all means, use it! There are many reasons why the employment of the long cane is not yet appropriate for some children. For instance, the child's developmental maturity level may not be at the point where managing a long cane is developmentally appropriate. Her gross and/or fine motor skills may not yet be at the point where she can successfully manage the long cane. She may not be able to understand the fundamental concept that the device in front of her body is actually an extension of her body, or she may be fearful of moving in the environment. She may not be able to maintain her balance... and so forth. I have found that if I work with these issues by creating a device that specifically addresses these challenges, the likelihood of effecting a successful long cane experience in the future increases.

WHY AN ADAPTIVE MOBILITY DEVICE IS NEEDED

There are many reasons why an adaptive mobility device may be necessary to meet a child's O&M needs. Some of these include:

- To provide the child a safe and secure means of moving around as independently as possible in his environment
- To offer the child a means to move about freely in his environment
- To assist the child in the process of becoming a safe and efficient cane user
- To provide the child with a "user friendly" bumper and probe
- To offer a means by which the child will have almost immediate success in O&M

- To assist the child in his ability to process all relevant sensory information by reducing and/or eliminating his safety and fear concerns
- To aid in correcting the child's awkward and atypical gait patterns and poor postural positioning

Additional benefits from using an adaptive mobility device include

- Decreased tactual defensiveness by increased regular interaction with the child's various environments
- Increased contact with peers
- Expanded interaction with all aspects of the child's environment
- Tangible, first-hand experience with real travel situations

DETERMINING THE APPROPRIATE DEVICE

The main issues to consider when evaluating the child for an adaptive mobility device are his

- Walking or emerging walking skills
- Level of fear (or lack of) in moving
- Comprehension level of arms/hands as an extension of his body
- Understanding of the mobility device as an extension of his body

When the child begins to indicate that he is ready to walk (i.e., pulling up to a standing position, cruising furniture, accepting an offered hand, or pushing push-type toys), he may be ready for an adaptive mobility device. A device can easily and with little expense be constructed. It will serve to encourage the child not only to stand independently, but also to attempt walking movements under safe and secure conditions. Care should always be taken to ensure that the child is steady when using the device, either by initially not attaching wheels on the device or by making sure that an adult steadies the device whenever the child is using, or is likely to use, the device. Remember, the goal is to provide a safe and secure means for the child to start to move around in his environment. Therefore, facilitating positive first experiences with the device is of the utmost importance.

For a child who is fearful about moving around in his environment, a device may be constructed that ensures the child's physical safety. It will also teach him about his surroundings without having to unintentionally bump into objects in his path with various parts of his body.

Andrew's pusher provides him with a "user friendly" bumper and probe.

When the child begins to indicate that he is ready to walk (i.e., pushing push-type toys), he may be ready for an adaptive mobility device.

Byron explores his new MoveAbout.

TYPICAL SEQUENCING AND DEVICE TRANSITION

A child's sequence of device-use begins with the push-type toys, to the MoveAbout, to the Pusher, to the long cane (with or without an L-Bar). Oftentimes, children use two different devices for different purposes and situations. For instance, a child may keep a Pusher in his classroom to be used for general travel, and be receiving long cane training during his O&M lesson. The amount of time a child uses one device before transitioning to another varies from one child to the next. Unfortunately, there is no set formula for determining the "what, when, and how" of mobility devices.

A MoveAbout is usually the mobility device I use as an "introductory" device. In addition to its ease of use, the MoveAbout offers nearly full body protection. It allows the child to independently and safely move in the environment without bumping walls and other objects, while realizing the advantages of movement. When the child is comfortable in moving, is not fearful, understands the device as an extension of his body, manages and navigates it properly, and is responsible for the use and storage of the device, then it is time to transition to a Pusher.

Unlike the MoveAbout, the Pusher requires that the child support the device. In other words, it is not free-standing. It also requires more refined gross motor skills in order to control and navigate the device. It is less cumbersome, but offers less protection. It adapts to uneven surfaces more than the MoveAbout and can be easily managed with one hand if needed. Again, once the child starts to indicate that he is ready for something more challenging—usually indicated by casual employment of the Pusher—it is time to start formal transition to the long cane.

When the child has long since been introduced to the cane in various informal situations, it is no longer a foreign object. Just like other mobility devices, the cane is something that is used for safe travel. I usually do not attach an L-Bar to the cane unless there is a strong indication that the child is not going to be successful without it. If the child is able to keep her cane in front of her body without an excess of verbal and physical reminders, an L-Bar is not indicated. If, however, the cane is not maintained in front of her body, then the addition of an L-Bar is needed. I usually have the child help me make the device and place it on her cane. Children seem to enjoy this activity and I believe it helps them understand the purpose of the L-Bar. The child is free to switch hands between cane grip and L-Bar and can use only one hand if she is able to consistently keep the cane in front of her body. Decreased use of the L-Bar is a direct indicator that it is time to remove it from the cane. Sometimes a child will ask me to take the L-Bar off, at which point we talk about "the rules" for using the cane without the L-Bar. With few exceptions, once the device is removed, she is able to maintain the cane in front of her body on a consistent basis.

Regardless of the type of device employed, the child with whom you are working should be encouraged to bump into walls, doors, and other large objects. Children can even bump into each other with their devices. This can be a great tool for teaching social skills and encouraging children to interact with each

These devices can be a great tool for teaching social skills and encouraging children to interact with each other.

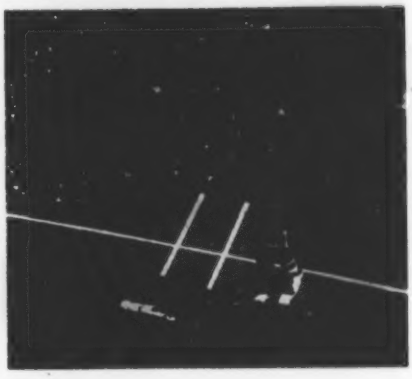
other. Give him lots of verbal information regarding the items he is contacting. Let him investigate what he has found and then continue to find other things. I use a device with some children to get them standing, and then with time comes moving, then walking, then running. For others, the device serves as a "reward" after their cane lesson. If the device is set on casters, it offers very little in the way of orientation, so the O&M specialist will need to provide this component.

SAFETY INFORMATION

While the devices described in this booklet offer a substantial amount of protection, they are by no means completely safe: They **require 100% supervision**. They are also not a replacement for the cane or any other device, but are intended to aid in facilitating developmental mobility skills. They are intended to assist the child in developing safe and efficient travel skills and in no way should be misconstrued to be a replacement for any relaxation of vigilant supervision. Extra caution should be taken on certain types of surfaces: wide cracks, inclines/declines (especially down!), drop-offs, and grass or other rough surfaces. Although the Pusher can be used to detect drop-offs, it should not be used on stairs and extra attention should be practiced when the child is near drop-offs. If appropriate, the Pusher may be carried by the child when travelling on stairs, but should not be used to navigate steps. The devices can be used both indoors and outdoors. Most importantly, although these mobility devices are designed to allow children freedom of movement in controlled environments, they are not intended to be used unsupervised. Ideally **all devices should be used in conjunction with an O&M professional**.

The Pusher adapts to uneven surfaces more than the MoveAbout and can be easily managed with one hand if needed.

Tiffany uses her MoveAbout to safely travel through the hallway.



Andrew freely explores the playground with his Pusher.

Using a long cane with an L-Bar, Kimberly independently travels up the ramp.

The Arc-Definer is used to refine Kimberly's long cane skills.

TYPES OF DEVICES

This booklet describes four types of devices, along with their respective adaptations. It is hoped that this information will be but a beginning. From this foundation you can design and construct devices that are specific to the individual needs of the children you serve. They range from a child's first device to a device that is used by the instructor:

- The MoveAbout
- The Pusher
- The L-Bar (original concept by Gene Healy)
- The Arc-Definer (original concept by Gene Healy)

To those who are not accustomed to doing these types of projects, the instructions may seem difficult, but really they are not. In terms of level of difficulty, the MoveAbout is the most involved. The devices are presented in their typical sequence of use. You might want to first make a Pusher in order to get the "feel" of the process. Once you have experimented with the materials, you will begin to develop your own formulas for determining size, assembly strategies, and individualized variations. I began by taking my best guess, putting the device together, having a child briefly use it, and then making adjustments where necessary. My first couple of devices were not useable, and even if I had not destroyed them, I would not have dared let anyone see them! The instructions below are by no means "hard and fast" rules, but rather serve as a guide to finding what works best for you and the students you serve.

A word about jargon: The terminology used throughout these instructions utilizes, for the most part, basic plumbing terms. Although I have tried to limit the use of jargon in these instructions, when you go to purchase materials you will most assuredly run into the following terminology:

ELL	Elbow joint
SOL	Side Out Elbow joint
TEE	Tee joint
S	"S" indicates a slip joint (non-threaded)
T	"T" indicates a threaded joint
SxS	Indicates a joint that has fittings that are both slip joints
SxT	Indicates a joint that has one slip fitting and one threaded fitting
SxSxT	Indicates a joint that has two slip fittings and one threaded fitting

Schedule 40 PVC, Schedule 120 PVC, etc. The number indicates the degree of thickness—the higher the number, the thinner the material.

(See the following page for a photo of these materials.)

Size indications and joint types, both on the PVC joints and in these instructions, will follow a specific, uniform denotation. For example, unless otherwise indicated, a ½" Slip x Slip ELL joint signifies an elbow joint that is ½" on both ends and has slip fittings at both ends. Similarly, a ¾"x ½" Slip x Threaded ELL joint denotes an elbow joint that is ¾" on the slip side and ½" on the threaded side. For those of you who are now completely confused, keep reading! Although this seems confusing it will make sense as you continue.

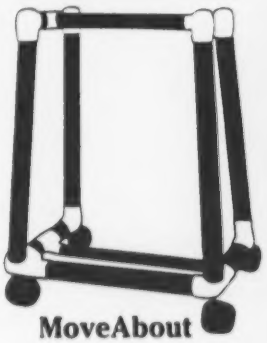
Although it is not a requirement, marking the pieces with a felt-type pen as you cut them can be very helpful. I do this even when I am putting each section together as I am cutting the pieces. This will not only reduce unneeded confusion as to which piece goes where, but will also help ensure success in the assembly and will further familiarize you with the various parts of each of the devices. You can use any terms, abbreviations, or acronyms you wish in order to manage the pieces—just make sure they make sense to you. Below is a list of the markings I use when building the devices. They are a bit elaborate, but I have found them useful.

Possible Abbreviations for Labeling Pieces

FLL	Front Left Leg
FRL	Front Right Leg
BLL	Back Left Leg
BRL	Back Right Leg
TSFL	Top Side Front Left
TSFR	Top Side Front Right
TSBL	Top Side Back Left
TSBR	Top Side Back Right
BSFL	Bottom Side Front Left
BSFR	Bottom Side Front Right
BSBL	Bottom Side Back Left
BSBR	Bottom Side Back Right
TCB	Top Cross Bar
BCBF	Bottom Cross Bar Front
BCBM	Bottom Cross Bar Middle

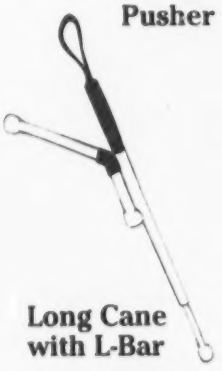
Within the instructions for each of the devices, there are "pre-gluing" and "gluing" instructions. The instructions are divided in this manner in order to allow for evaluation and experimentation with the device prior to gluing, and to ensure that the device will not be put together wrong. Since much of "getting it right" comes with experimentation, the pre-

DEVICE INSTRUCTIONS



MoveAbout

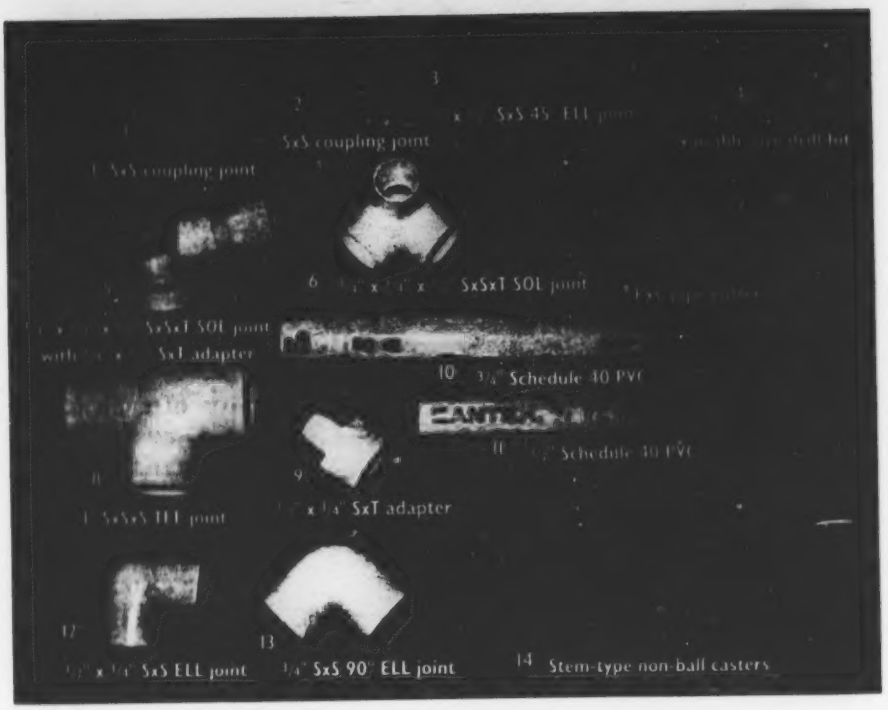
Pusher



Long Cane with L-Bar

Arc-Definer

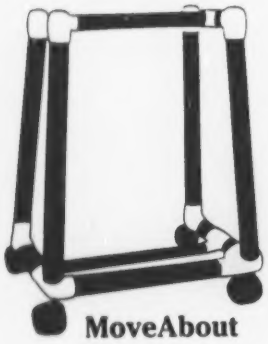
1. 1" Slip x Slip coupling joint
2. ½" Slip x Slip coupling joint
3. ½" x ½" Slip x Slip 45° ELL joint
4. Variable size drill bit
5. ¾" x ¾" x ½" Slip x Slip x Thread SOL joint with ¾" x ½" Slip x Thread adapter
6. ¾" x ¾" x ½" Slip x Slip x Thread SOL joint
7. PVC pipe cutters
8. 1" Slip x Slip x Slip TEE joint
9. ½" x ¾" Slip x Thread adapter
10. ¾" Schedule 40 PVC tubing
11. ½" Schedule 40 PVC tubing
12. ½" x ¾" Slip x Slip ELL joint
13. ¾" Slip x Slip 90° ELL joint
14. Casters


5x5 coupling joint
5x5 coupling joint
5x5x5 TEE joint
x ¾" SxT adapter
¾" x ¾" SxS ELL joint
¾" SxS 90° ELL joint
14 Stem-type non-ball casters

gluing steps also afford the opportunity to make size adjustments prior to gluing. Success will be increased if you are always sure to work on a flat surface. Additionally, cleaning the PVC pieces with either PVC cleaner or some other type of cleaner will help ensure that the pieces stay glued together.

THE MOVEABOUT

As mentioned before, this is the most difficult of the devices to construct, but it will provide the most appropriate and valued travel experiences to children who require this type of device. Three basic construction designs for the MoveAbout are described below. All require the use of a power drill in order to form the holes in the underside of the device to accommodate the installation of the casters. The first design requires the least number of PVC fittings, but does require using a power drill with either a drill bit matching the size of the PVC tubing to be used, or a variable size drill bit used to drill the large holes which the "legs" of the device will fit into. Due to the nature of the PVC fittings, this can sometimes be a difficult task, especially for power drill novices. The second design eliminates the use of the power drill to drill the holes for the legs, but requires more PVC fittings and some adjustments in the length of the leg height. Both of these devices are fixed in size. The third is a device that is constructed in such a way that the legs can easily be removed and replaced with various sizes to increase the device's capacity to serve more than one child, or to "grow" with the child if she requires the device over a long period of time. The cost of materials for this device at publication time was $15–20. Each option has minimal cost differences, depending on the type and amount of fittings required. Initial start-up costs can be as low as $25 for a basic power drill and drill bits, and under $10 for a PVC cutter. A tape measure and a pair of safety goggles may also be purchased at minimal cost.



MoveAbout

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Basic Tools and Materials Needed for All Three MoveAbout Options

- PVC pipe cutters
- Power drill
- ⅛" drill bit
- Tape measure
- PVC glue
- Safety goggles
- Marking pen

Optional

- Padding for top cross bar (foam-type pipe insulation works great)
- Spray paint, bicycle handlebar wrap, colored plastic adhesive tape
- "Channel lock" pliers (optional, but very helpful!)

Below are sample dimensions for an Option #1 MoveAbout for a two-year-old child who is 30" tall. Measurement from floor-to-elbow is 22" and no special adaptations are needed. If these dimensions are applied to Option #2, remember to deduct 1½" from the front legs. If they are used for Option #3, deduct the 1½" from all four legs. The number of pieces required is indicated in parentheses:

- Vertical legs are 18" (4 ea.)
- Top cross bar is 13" (1 ea.)
- Bottom cross bars are 15" (2 ea.)
- Top side pieces are 3½" (4 ea.)
- Front bottom side pieces are 3" (2 ea.)
- Rear bottom side pieces are 6" (2 ea.)

Using these dimensions, when the device is constructed, including casters, it should be approximately 22" tall, 14½" wide (side to side) at top and 16½" at bottom. It should be 10" deep (front to back) at top and 13" at bottom.

The MoveAbout: Option #1
All Drill

Option #1 will produce a device that is fixed in size. It uses the least number of PVC fittings but in addition to the holes that accommodate the caster stems, it requires that a power drill be employed to drill large holes on top of the front two ELL joints.

Materials and Additional Tools Needed

- ¾" or 1" variable size drill bit (drill bit size should match the diameter of the PVC tubing)
- ¾" Slip x Slip 90° ELL joints (8 ea.)
- ¾" Slip x Slip TEE joints (4 ea.)
- Approximately 8 to15' of ¾" or 1" Schedule 40 PVC (depending on height/width of device; using thinner PVC tubing is not recommended for this device)
- Stem-type non-ball casters (4 ea.)

The MoveAbout is the most difficult of the devices to construct, but it will provide the most appropriate and valued travel experiences to children who require this type of device.

The MoveAbout: Option #1
All Drill, continued

It is helpful to have extra fittings and tubing so that if you make a mistake, you can correct it without having to stop working to go and get the required materials.

Pre-gluing Instructions

When determining measurements in the instructions provided below, keep in mind that the joints or fittings add approximately one inch per joint to the total measurement.

The instructions provided below are for standard, unmodified MoveAbouts. They do not address unique modifications required to individualize a particular device. In order to decide upon necessary modifications, I recommend that you first construct the standard device according to the child's measurements, and then make modifications after you have observed the child briefly using the device. This will allow you to identify the required modifications in order to customize the device. An example of a modification might be for the child who tends to lean backwards. One solution to correct this problem would be to make the front legs slightly shorter than the rear—making the device lean slightly forward—in order to help the child assume a more upright position. Once the necessary modifications have been decided upon, you can begin modifying the device. All tubing pieces can be increased or decreased in size by using a fitting called a "connector." If you are reducing the size, simply cut out the unwanted length(s) using PVC pipe cutters and glue each new end into a connector. If you are increasing the size, make one cut in the tubing, glue a connector on each end, and in between the connectors glue the length of tubing needed to achieve the desired size. This process must be done for all parallel components (i.e., legs, cross-bars), or the result will be a severely lopsided device. Experiment until you get what you want; one of the joys of PVC is that it is extremely versatile, and if you really need to, it is inexpensive enough to start over again.

The white lines illustrate the height and top and bottom widths determined in Steps [1], [2], and [3].

[1] Determine height: The top of the device should come to the child's elbow, or just below. Remember to deduct the space the casters will add to the total height of the device (approximately 2½"). Measure and cut the leg pieces (4 ea.).

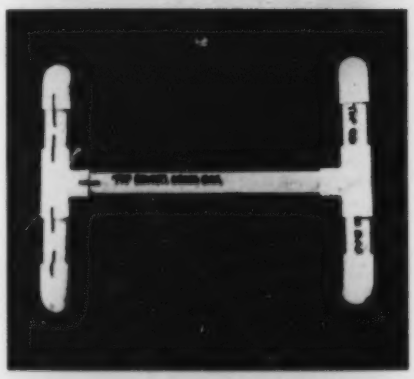
[2] Determine top and bottom widths: The top width should be the width of the child's body, plus 3" or 4" on each side to allow for free movement. The bottom width should be 2" wider than the top width. This produces a flared-out design. The child's hands will be protected from injury when the device comes into contact with objects, yet still be close enough to accommodate easy exploration. A typical device is 15" wide at the top and 17" wide at the bottom. Measure and cut the top cross bar (1 ea.) and the bottom cross bars (2 ea.).

[3] Measure and cut side pieces: The flared-out design applies here as well. There will be four pieces for the top, all of equal size, typically about 3½". The bottom will have four pieces also, but will be two different sizes. Two pieces will be approximately 3" (front) and the other two pieces will be approximately 6" (back). When constructed, the total front-to-back measurement at the top of the device will be approximately 11½", and the bottom will be approximately 13½".

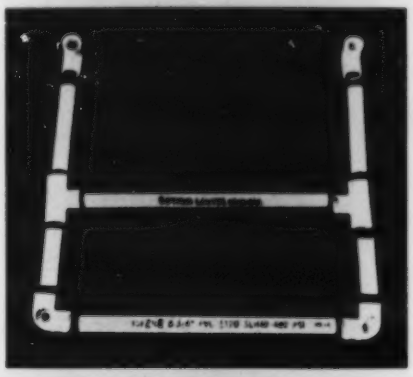
[4] Construct the top frame by putting the single side of the TEE joints onto the ends of the top cross bar, and the four top side pieces into the double sides of the TEE joint. Then add four ELL joints on the ends of the top side pieces (open holes all facing down). The result should be a flat, square frame. Make sure the tubing is completely inside of the fitting by grasping either the joint or the tubing and firmly tapping it on the ground. Perform this procedure on all joints.

[5] Construct the bottom frame by putting each end of the front bottom cross bar into two ELL joints and the remaining bottom cross

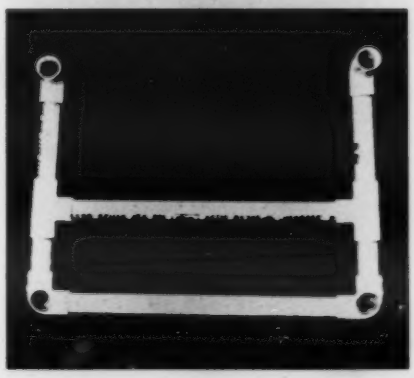
Step [4] The top frame laid out and ready for assembly.



Step [4] The top frame assembled.

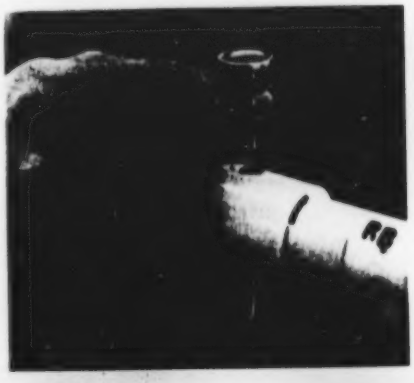


Step [5] The bottom frame laid out and ready for assembly.

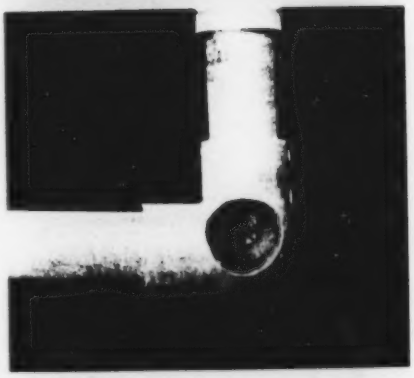


Step [5] The bottom frame assembled.

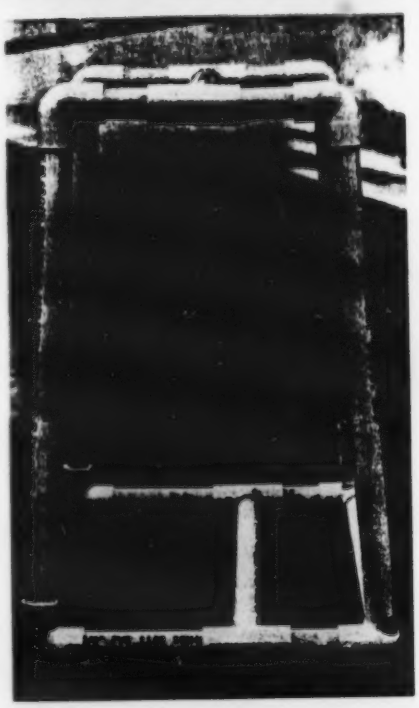
bar into the single side of the TEE joints. Then put the bottom side pieces into the ELL and TEE joints, and the remaining two ELL joints into the rear bottom side pieces. The two ELL joints that will house the back legs should be placed so that the hole is facing up. The result should be a flat, square frame. Congratulations, you're halfway there!



The caster stem goes into the ⅞" hole drilled on the underside of the bottom frame in Step [6].



This is the hole drilled in the topside of the bottom frame in Step [7] to house the leg.



Step [8] The top and bottom frames are connected with the four leg pieces. Note the flared out design top to bottom, front to back, and side to side.

[6] Place the bottom frame face-down on a solid surface and drill a ⅞" hole in the center of each ELL joint to house the casters. Make sure the holes are the correct size by inserting the stem sleeves inside the previously drilled holes. You may need to gently tap the stem sleeves in order to make them slip all the way into the hole. If the hole is too small, simply re-drill the hole until it is correct. If the hole is too big, simply remove the ELL joint, replace it with a new one, and drill a new hole.

[7] Place the frame face-up on a solid surface. Use either a variable size drill bit or a drill bit matching the size of the PVC tubing to carefully drill the holes in the center of the two front ELL joints to house the front legs. This task might require some "trial and error" in order to get the holes the correct size. Keep in mind that due to the nature of the PVC joints, drilling the holes might not be a smooth "in and out" procedure. Additionally, when the tubing is placed in the holes, there may be gaps in the fit. This is nothing to be concerned about; using slightly more PVC glue during the gluing process will ensure a secure weld.

[8] Connect the top and bottom frames by placing the leg pieces in the appropriate openings of the ELL joints.

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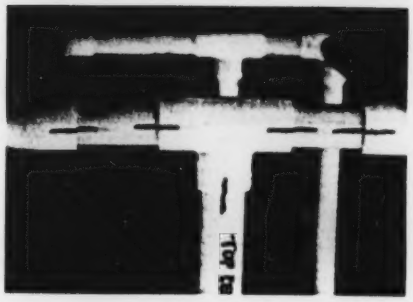
[9] Adjust the device until it is symmetrical from left to right, top to bottom, side to side and you will have a precise rectangular shape. After all the adjustments have been made, use a marking pen to draw match-up lines on the fittings and their respective pieces so that when you start to glue the pieces together the device will not be disproportionate.

Gluing Instructions

Once you have put the device together and you are sure the size is accurate, proceed with the gluing instructions. If you are not sure about the dimensions, or if you want to observe the child using the device prior to gluing (while remembering that the sections come apart easily), you can have the child hold the device and take a few steps with it. If any of the joint/tubing combinations are too loose, try putting a small amount of tape or plastic wrap around the end of the tubing.

Next, make alterations as needed based upon your knowledge of the child and the appropriate applications. Once you have finalized the dimensions, adjust the device so that it is squarely rectangular. Using a marking pen, draw line-up marks on the joint/tube combinations so that as you disassemble and reassemble the device you can match up the marks to ensure proper alignment.

Following the same sequence used in the pre-gluing instructions, dismantle the device one section at a time. Then glue one section or joint/tube combination at a time so that the pieces and match-up lines do not become mixed-up.



A side view of the MoveAbout showing the match-up lines.

[1] Start the gluing procedure by dismantling one section at a time (this is where the application of the pliers comes in handy) and then reassembling the section with glue. Doing this will reduce the likelihood of pieces getting mixed-up, or mismatching match-up lines, resulting in a lopsided, unusable device. Carefully disassemble and glue together each section, remembering to match line-up marks in the following sequence:

- Glue top pieces together to form a flat square frame
- Glue bottom pieces together to form a flat square frame
- Glue all four legs into openings in bottom square frame
- Glue top square frame onto top of legs.

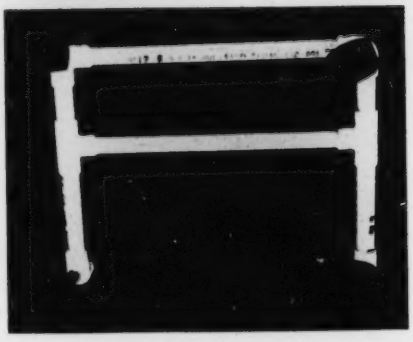
The PVC glue dries very fast (3 to 5 seconds), so work quickly with each assembly and make sure the lines match-up. If you make a mistake, simply measure and cut new pieces, put the device together following the "pre-gluing assembly instructions" and resume construction at the point where the error occurred.

[2] Place the device upside down and insert the stem of each caster into the sleeves. You may need to push these with a slight force until a click is heard or felt. If the

The MoveAbout: Option #1
All Drill, continued

device is to be painted, the casters should first be removed or the glide of the casters will be ruined. If you are using bicycle handlebar tape or adhesive, the casters do not need to be removed.

The sequence of caster assembly: Stem sleeve goes into ELL joint and caster goes into stem sleeve.



The bottom side of the MoveAbout with all four casters attached.

The MoveAbout: Option #2
Front Adapters Only

This fixed design eliminates the use of the power drill, but requires more PVC fittings and some adjustments in the length of the leg height. Same as Option #1, except for Steps 1 and 5 and the deletion of Step # 7.

Materials Needed

- ¼" Slip x Slip 90° ELL joints (6 ea.)
- ¾" x ¾" x ½" Slip x Slip x Threaded SOL joints; threaded sides are ½" (2 ea.)
- ¼" x ½" Slip x Threaded Adapter; threaded sides are ½" (2 ea.)
- ¼" Slip x Slip TEE joints (4 ea.)
- 8 to15' Schedule 40 PVC tubing
- Stem-type non-ball casters (4 ea.)

Pre-gluing Instructions

[1] Determine height: The top of the device should come to the child's elbow, or just below. Remember to deduct the space the casters will add to the total height of the device (approximately 2½") and the 1½" from the front legs to accommodate the addition of the adapters on the front of the device. Measure and cut the leg pieces (4).

[2] through [4] *Same as Option #1.*

[5] Construct the bottom frame by first putting each end of the front bottom cross bar into two SOL joints, and the remaining bottom cross bar into the single side of the TEE joints. Then add the bottom side pieces to the SOL and TEE joints, and the remaining two ELL joints to the rear bottom side pieces. Finally, screw the adapters into the threaded side of the SOL joints. The frame should lay flat when placed on a flat surface. The two ELL joints that will house the back legs should be placed so that the hole is facing up.

[6] *Same as Option #1.*

[7] This step is eliminated because of the addition of the SOL joint and adapters.

[8] and [9] *Same as Option #1.*

Gluing Instructions

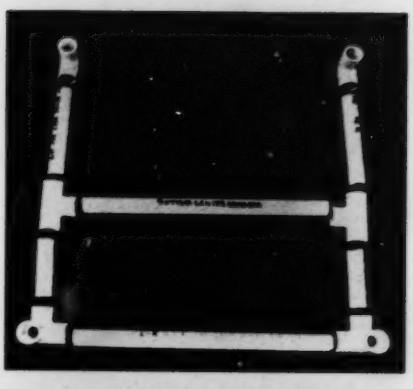
Once you have put the device together and you are sure the size is accurate, proceed with the gluing instructions. If you are not sure about the dimensions, or if you want to observe the child using the device

prior to gluing (while remembering that the sections come apart easily), you can have the child hold the device and take a few steps with it. If any of the joint/tubing combinations are too loose, try putting a small amount of tape or plastic wrap around the end of the tubing.

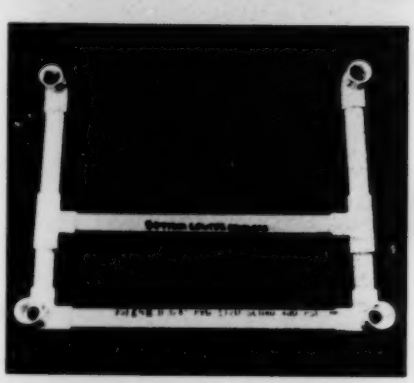
Next, make alterations as needed based upon your knowledge of the child and the appropriate applications. Once you have finalized the dimensions, adjust the device so that its corners are square, and its shape is rectangular. Using a marking pen, draw line-up marks on the joint/tube combinations so that as you disassemble and reassemble the device you can match up the marks to ensure proper alignment. Following the same sequence used in the pre-gluing instructions, dismantle the device one section at a time. Then glue one section or joint/tube combination at a time so that the pieces and match-up lines do not become mixed-up.

[1] Start the gluing procedure by dismantling one section at a time (this is where the application of the pliers comes in handy) and then reassembling the section with glue. Doing this will reduce the likelihood of pieces getting mixed-up, or mismatching match-up lines, resulting in a lopsided, unusable device. Carefully disassemble and glue together each section, remembering to match line-up marks in the following sequence:

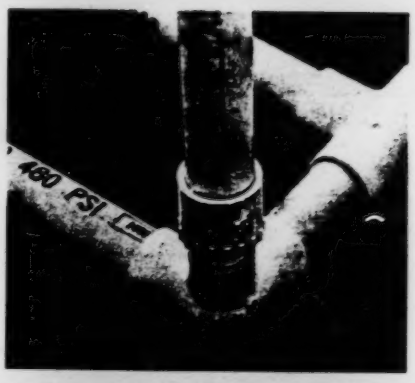
- Glue top pieces together to form a flat square frame
- Glue bottom pieces together to form a flat square frame
- Glue all four legs into openings in bottom square frame



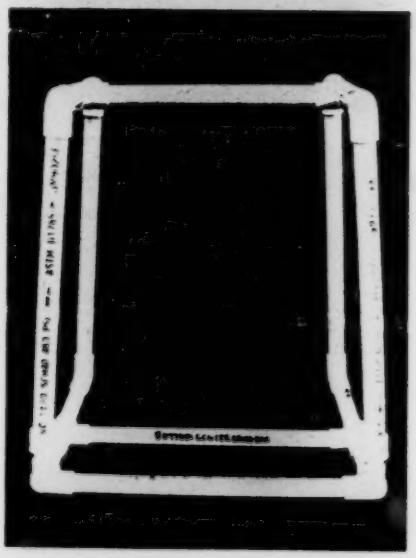
Step [5] of the Option #2 MoveAbout: The bottom frame laid out and ready for assembly.



Step [5] The bottom frame assembled.



Front right corner of the Option #2 MoveAbout from Step [5]. Note the adapter/leg assembly attached to the SOL joint. This assembly eliminates the need to drill large holes to house the leg pieces.



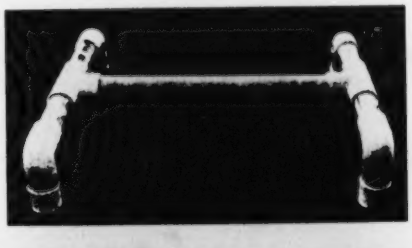
The top and bottom frames are connected with the four leg pieces. Note the difference in the front leg assemblies from Option #1 and the flared out design top to bottom, front to back, and side to side.

The MoveAbout: Option #2
Front Adapters Only, continued

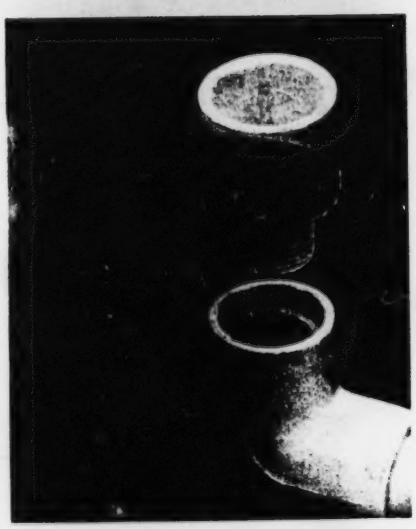
- Glue top square frame onto top of legs.

The PVC glue dries very fast (3 to 5 seconds), so work quickly with each assembly and make sure the lines match-up. If you make a mistake, simply measure and cut new pieces, put the device together following the "pre-gluing assembly instructions" and resume construction at the point where the error occurred.

[2] Place the device upside down and insert the stem of each caster into the sleeves. You may need to push these with a slight force until a click is heard or felt. If the device is to be painted, the casters should first be removed or the glide of the casters will be ruined. If you are using bicycle handlebar tape or adhesive, the casters do not need to be removed.



The top frame of the Option #3 MoveAbout from Step [4]. Note the adapters in the bottom of the ELL joints.



The ¾" x ½" Slip x Threaded adapter screws into the ELL joint.

The MoveAbout: Option #3
Drill Undersides Only with Interchangeable Legs

This adjustable design is the same as Option #1, except for Steps 1, 4 and 5, and the deletion of Step 7.

Materials

- ¾" x ½" Slip x Threaded ELL joints* (6 ea.)
- ¾" x ¾" x ½" Slip x Slip x Threaded SOL joints* (2 ea.)
- ¾" x ½" Slip x Threaded Adapters* (8 ea.)
- ¾" Slip x Slip TEE joints (4 ea.)
- ¾" The length depends on how tall you want the device* (4 ea.)
- Approximately 5' of Schedule 40 PVC tubing (depending on height/size of device)
- Stem-type non-ball casters (4 ea.)
- PVC glue

*Sets of legs can be cut in any length. You may want to make several sets by cutting four legs of the same length and gluing them into the adapters. The adapters are then screwed in/out of the SOL joint to change the height of the device.

Pre-gluing Instructions

[1] Determine height: The top of the device should come to the child's elbow, or just below. Remember to deduct the space the casters will add to the total height of the device (approximately 2½").

[2] and [3] *Same as Option #1*

[4] Construct the top frame by putting the single side of the TEE joints onto the ends of the top cross bar. Then insert the four top side pieces into the double sides

of the TEE joint, and add the four ELL joints (threaded sides all facing down) on the ends of the top side pieces. Make sure the tubing is completely inside of the fitting by grasping either the joint or the tubing and firmly tapping it on the ground. Apply this procedure to all joints.

[5] Construct the bottom frame by putting the slip sides of the two SOL joints onto the ends of the front bottom cross bar (threaded side up). Then insert the remaining bottom cross bar into the single side of the TEE joints, and add the bottom side pieces to connect the SOL and TEE joints. Finally, add the remaining two ELL joints to the rear bottom side pieces (threaded side up). The frame should be flat when placed on a flat surface.

[6] *Same as Option #1.*

[7] This step is eliminated because of the addition of the SOL and ELL joints and adapters.

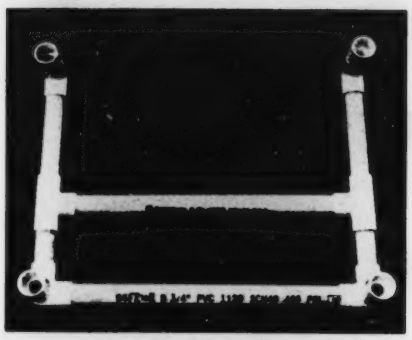
[8] and [9] *Same as Option #1.*

Gluing Instructions

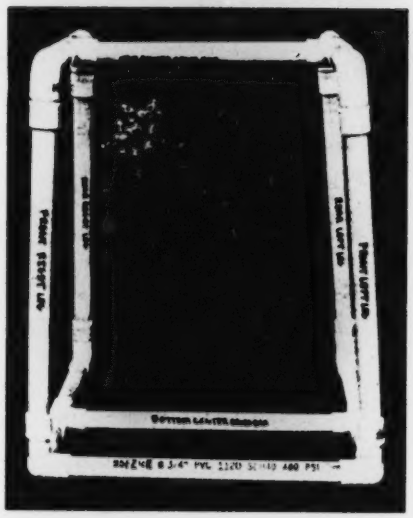
Once you have put the device together and you are sure the size is accurate, proceed with the gluing instructions. If you are not sure about the dimensions, or if you want to observe the child using the device prior to gluing (while remembering that the sections come apart easily), you can have the child hold the device and take a few steps with it. If any of the joint/tubing combinations are too loose, try putting a small amount of tape or plastic wrap around the end of the tubing.

Next, make alterations as needed based upon your knowledge of the child and the appropriate applications. Once you have finalized the dimensions, adjust the device so that it is squarely rectangular. Using a marking pen, draw line-up marks on the joint/tube combinations so that as you disassemble and reassemble the device you can match up the marks to ensure proper alignment. Following the same sequence used in the pre-gluing instructions, dismantle the device one section at a time. Then glue one section or joint/tube combination at a time so that the pieces and match-up lines do not become mixed-up.

[1] Start the gluing procedure by dismantling one section at a time (this is where the application of the pliers comes in handy) and then reassembling the section with glue. Doing this will reduce the likelihood of pieces getting mixed-up, or mismatching match-



Step [5] The bottom frame of the Option #3 MoveAbout. Note the adapters in the SOL and ELL joints.



The top and bottom frames are connected with the four leg pieces. Note the adapters in the leg assemblies and the flared out design top to bottom, front to back, and side to side.

The MoveAbout: Option #3
Drill Undersides Only &
Interchangeable Legs, continued

up lines, resulting in a lopsided, unusable device. Carefully disassemble and glue together each section, remembering to match line-up marks in the following sequence:

- Glue top pieces together to form a flat square frame
- Glue bottom pieces together to form a flat square frame
- Glue all four legs into adapter openings in bottom square frame
- Screw leg assemblies (leg piece and adapter) into top and bottom frames to complete the Option #3 MoveAbout (see photo on page 17).

The PVC glue dries very fast (3 to 5 seconds), so work quickly with each assembly and make sure the lines match-up. If you make a mistake, simply measure and cut new pieces, put the device together following the "pre-gluing assembly instructions" and resume construction at the point where the error occurred.

[2] Place the device upside down and insert the stem of each caster into the sleeves. You may need to push these with a slight force until a click is heard or felt. If the device is to be painted, the casters should first be removed or the glide of the casters will be ruined. If you are using bicycle handlebar tape or adhesive, the casters do not need to be removed.

THE PUSHER

The Pusher utilizes the basic design of a device that has been used in the O&M field for a long time. That design was built around a rectangle. Various modifications were made to make the device more appropriate and easier to make. The straight rectangular design did not allow the child to push it smoothly, due to the angle of the device. Adding curved ends to the bottom of this device was an improvement over the straight rectangular design, but still presented problems.

The first problem was producing curved ends; a process that is done by placing the PVC end pieces in an oven at a very specific temperature, heating them to make them malleable, and then bending both end pieces at exactly the same angle in order to ensure a device that was not lopsided. The next problem I encountered was that the rounded ends still did not provide the necessary smooth glide. I found this especially true on semi-rough surfaces such as carpet or blacktop.

What I found most problematic about the rounded-end design was the way in which the bottom portion of the ends wore down from normal use. The ends quickly became flat as a result of contact with the ground. Even a slight amount of wear caused the device to become stuck more than it normally would. With more wear, the ends eventually wore through the tubing, causing perforations and even more resistance. At this point the device was no longer useable to facilitate ease of movement and a successful travel experience.

Pusher

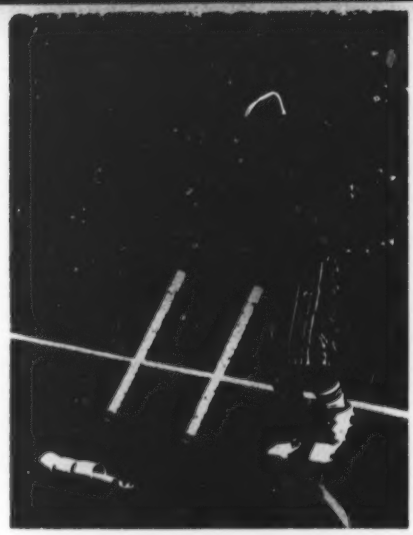
The device presented here is the result of experimenting with various revisions of the basic rectangular shape. Following the gluing instructions there are instructions for making a hand placement modification for children who have difficulty grasping the side bars.

Tools and Materials Needed

- PVC pipe cutters
- Marking pen
- Tape measure
- Safety goggles
- PVC glue
- ½" thick Schedule 40 or 125 PVC tubing (amount depends on child's measurements, see below)
- Slip x Slip ELL joints (4 ea.)
- 45° Slip x Slip ELL joints (2 ea.)
- 1½" Slip x Slip connector joints; will serve as "rollers" (3 ea.)
- Optional: Spray paint, bicycle handlebar wrap, colored plastic adhesive tape, etc., and padding for center cross bar

Purchasing extra tubing and joints will afford a margin of error and let you experiment with different lengths and widths.

The length of the Pusher should be approximately the same as that of the long cane. As is pertinent when determining the appropriate length of the long cane, considerations such as reaction time, stride, and pace must also be taken into account in addition to the child's height. The device, when held in front of the body (hands positioned on the sides of the device, elbows slightly bent) should offer a protection distance of two strides. As with the long cane, the goal is to provide the child with adequate space in order to react to environmental factors, but not so much as to impede movement.



The Pusher utilizes a design that was built around a rectangle.

The width should be based on the child's shoulder width. For most children, 10" is the norm and this measurement can be used as a standard. Some children, however, will require a narrower or broader device to appropriately accommodate their body width. If the width is too broad, the child will have difficulty maintaining his hands on the sides of the device. If it is too narrow, the child's body will not be fully protected. Additionally, an improper width can result in the child receiving, and possibly storing, misleading information regarding the size of his body, as well as the required breadth needed to clear doorways, wall, doors, and other objects.

Three sample dimensions for the Pusher are provided below:

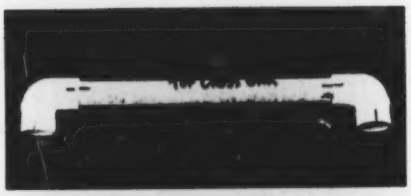
Sample #1 The child is 35" tall with an average pace and reaction time:

- Top and bottom cross bars are 10"
- Side bars are 18"
- Side extension bars are 6"
- Total height of device is 26"*

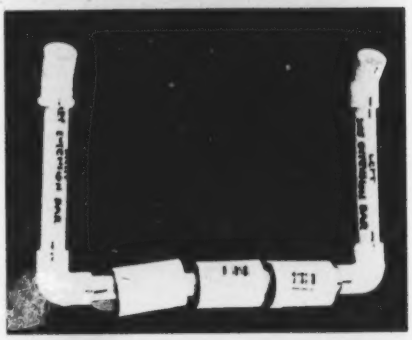
Sample #2 The child is 36" tall with an average pace and slow reaction time:

- Top and bottom cross bars are 10"
- Side bars are 19"
- Side extension bars are 6"
- Total height of device is 27"*

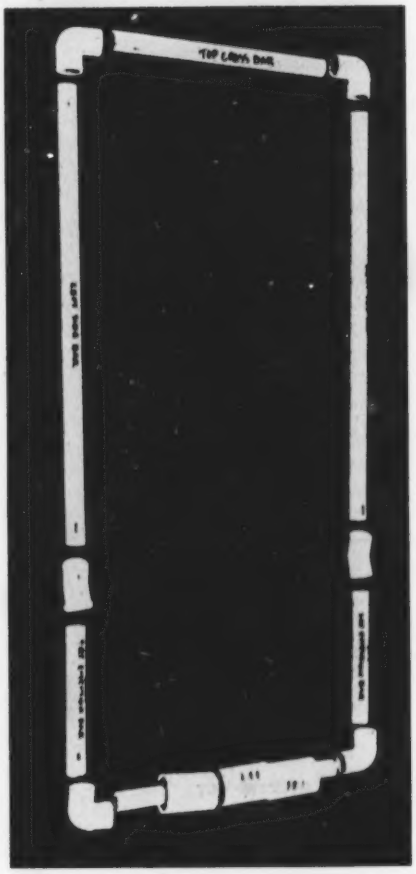
Step [2] The top section assembly of the Pusher.



Step [3] The bottom section assembly.



All pieces laid out and ready to be assembled.



Sample #3 The child is 27" tall with a fast pace and reaction time, but has a narrow body width:

- Top and bottom cross bars are 8"
- Side bars are 16"
- Side extension bars are 5"
- Total height of device is 23"*

*Measured diagonally from bottom cross bar to top cross bar

Pre-gluing Instructions

[1] Measure, cut, and label the top and bottom cross bars, long side bars, and short side bars.

[2] Construct the top section by placing an ELL joint on each end of the top cross bar. The open ends of the ELL joints should face down.

[3] Construct the bottom section by placing one ELL joint on the end of the bottom cross bar. Add the three 1½" connector fittings and place the other ELL joint on the open end of the bottom cross bar. Place the side extension bars (short) into the open ends of the ELL joints that are connected to the bottom cross bar. Onto the ends of the side extension bars, add the 45° ELL joints. The two open ends of these final joints should face up.

[4] Connect the two sections by placing the two long side bars into the open holes of the 45° ELL joints and then attaching the top section onto the long side bars.

Gluing Instructions

Once you have put the device together and you are sure the size is accurate, proceed with the gluing instructions. If you are not sure about the dimensions or if you want to observe the child using the device prior to gluing (while remembering that the sections come apart easily), you can have the child hold the device and take a few steps with it. If any of the joint/tubing combinations are too loose, try putting a small amount of tape or plastic wrap around the end of the tubing.

Next, make alterations as needed based upon your knowledge of the child and the appropriate applications. Once you have finalized the dimensions, adjust the device so that it is squarely rectangular. Using a marking pen, draw line-up marks on the joint/tube combinations so that as you disassemble and reassemble the device you can match up the marks to ensure proper alignment. Following the same sequence used in the pre-gluing instructions, dismantle the device one section at a time. Then glue one section or joint/tube combination at a time so that the pieces and match-up lines do not become mixed-up.

Hand Placement Modification

In addition to the materials needed for the basic Pusher, you will need:

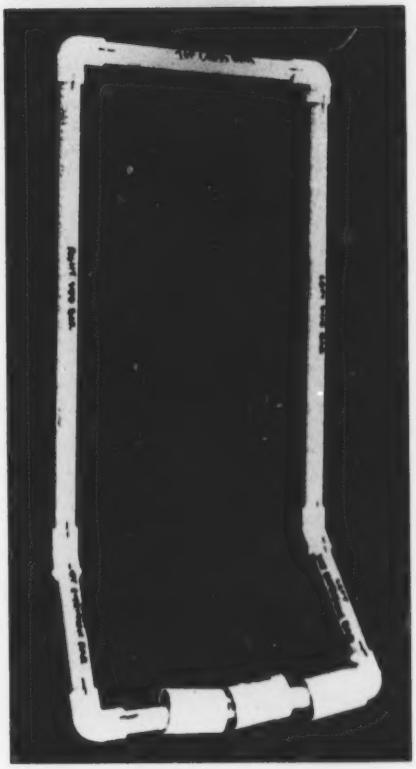
- ½" Slip x Slip TEE joints (2 ea.)
- ½" Slip end caps (2 ea.)

PVC tubing cut in the following lengths:

- 2" lengths (2 ea.)
- 4" lengths (2 ea.)

Follow the above instructions for constructing the Pusher, with the following changes:

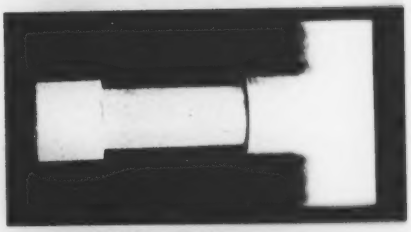
[1] At [2], add to the open end of the ELL joints the following assembly: Place an end cap on one end of the 4" pieces of tubing, then place the other end of the tubing into the single open end of one of the TEE joints. On one end of the "T" sides of the same TEE joint, insert the 2" tubing piece. The other end of the 2" piece goes into the open end of the ELL joint from the previously constructed top section of the Pusher. Repeat this procedure to assemble the remaining side.



A Pusher completely assembled and ready to be glued. Note the match-up lines.

[2] At [4], instead of attaching the two long side bars to the ELL joints of the top section, place them into the open "T" sides of each of the TEE joints.

Steven using his Pusher with modified handles. Note the big smile on his face!



Hand Placement Modification assembly. The open ends of the TEE joint attach to the side bars of the Pusher.

A Pusher with modified handles attached.

This side hand position eliminates the possibility of the child stepping into the open center of the device if the device should become stuck (for instance, in a crack).

Prior to gluing, the angle of the hand bars may be adjusted to accommodate the needs of the child.

Using the Pusher

For safety and the reasons cited below, I have the child grasp the lateral sides of the Pusher, just below the top cross bar, instead of holding onto the top cross bar. This side hand position eliminates the possibility of the child stepping into the open center of the device if the device should become stuck (for instance, in a crack).

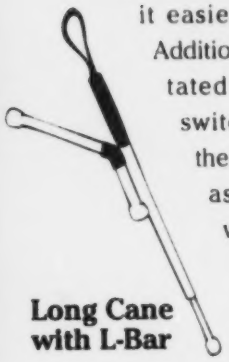
Side hand positioning also facilitates the child's increased control and manipulation of the device. Moreover, for children who tend to forget to maintain the device in front of their bodies, side-hand positioning offers a spontaneous physical reminder to place the device back in front of them. As the child releases one hand, causing the device to shift to his side, it in turn causes a dragging motion that hyper-supinates the arm and hand (rotates upward), sending information to the brain, letting the child know the device has shifted into an improper position. Finally, because the side-hand position on the Pusher very closely mimics grasping the grip of a long cane, transition to the cane in the future will not require learning a new hand position and grip.

Once the child has become comfortable with the device, I encourage him to extend each of his index fingers down the side bars of the device, as this, again, produces the hand grip that will be used when the child uses a long cane.

THE L-BAR

Originally represented by Gene Healy in the TAPS curriculum, the L-Bar has been an extremely helpful device. It is a very simple device used to help long cane users keep their cane in front of them.

The L-Bar described here differs from Mr. Healy's in that it is built at a 45° angle instead of a 90° angle. Because the 45° angle more imitates the angle of the long cane, I found it easier for the child to use. Additionally, I found that it facilitated the child's ability to switch hand placement on the L-Bar and the cane grip, as needed or desired, which I freely encourage. It attaches to the grip or the shaft of the long cane, resulting in a second "grip." I have found this device very useful in creating successful long cane experiences. It not only gives the child a second grip to hold onto, but also provides more physical information to her when she is letting the cane move away from the front of her body. In addition, it helps teach the concept of "cane centered," a more advanced long cane skill.



Long Cane with L-Bar

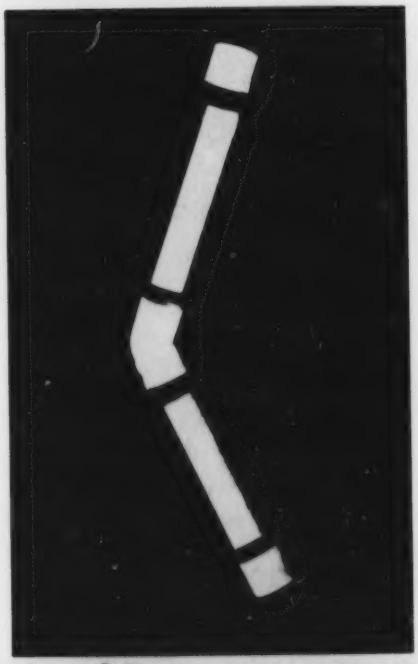
This device can be employed with all cane techniques, as long as it is appropriate and functional.

Materials

- Approximately 1' of ½" thick Schedule 125 PVC tubing
- 45° Slip x Slip ELL joint (1 ea.)
- ½" Slip end caps (2 ea.)
- PVC pipe cutters, a hacksaw or other cutting device
- Tape measure or ruler
- Safety goggles
- PVC glue

The L-Bar is a very simple device used to help long cane users keep their cane in front of them.

Cut one 4" and one 8" length of tubing. Place one end of each length in each end of the 45 Slip x Slip ELL joint. Place end caps on each open end of the tubing. If the device does not seem to be the proper dimen-



All the pieces of the L-Bar laid out and ready to be assembled.

The shorter end of the L-Bar is attached to the rounded side of the grip.

sions for the child's needs, make necessary adjustments prior to gluing. Affix the shorter end of the device to the rounded (non-flat) side of the grip with tape, Velcro, or another type of fastening material (vertical tube is extending away from the cane).

In order to facilitate the cane being maintained in the centered forward position, the L-Bar should be attached to the cane so that the end of the longer, vertical bar is approximately flush with the top of the original cane grip.

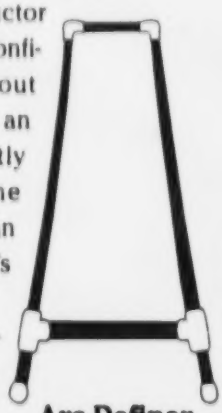
ARC-DEFINER

(Original concept by Gene Healy)

This is a device used specifically by the instructor for teaching the concept of "arc." The arc is the area that the cane covers when it moves from side to side. The arc width is determined by the breadth of the child. It will be adjusted as the child grows. It is important that it be only wide enough to cover the travel path directly in front of the child. If it is too narrow then the child is not fully protected, and if it is too wide, it will contact unnecessary items in the environment, including other travelers.

The instructor holds the device extended in front of her and walks backwards. The child walks toward the instructor, moving her cane from side to side within the arc, using either the constant contact or touch technique. The Arc-Definer provides the child with a uniform arc model, eliminating the unnecessary transmission of misinformation caused when the long cane is being moved about in open space. In addition to the consistent, physical relay of information regarding the location of her cane, the child is praised for her persistent accuracy.

This device also establishes enough physical distance between the student and the instructor to impart a sense of self-confidence in the child, without jeopardizing her safety. As an added bonus, it greatly lessens the need for the instructor to constantly lean over to correct the child's cane technique.



Arc-Definer

Two options for constructing the device are presented here; in one, the arc width is fixed, and in

the other, it is adjustable. If the device is to be used exclusively with students who have approximately the same arc width, Option #1, a fixed-size device, will be suitable. But if you have students with different arc widths, you might consider taking the time to make Option #2, an adjustable-size device. This adjustable device requires buying a short length of foam-type pipe insulating material.

Option #1: Fixed

- ½" Slip x Slip ELL joints (2 ea.)
- ½" Slip x Slip x Slip TEE joints (2 ea.)
- Approximately 10' ½" Schedule 40 or 120 PVC tubing*
- ½" Slip end caps (2 ea.)
- PVC pipe cutter
- Safety goggles
- PVC glue

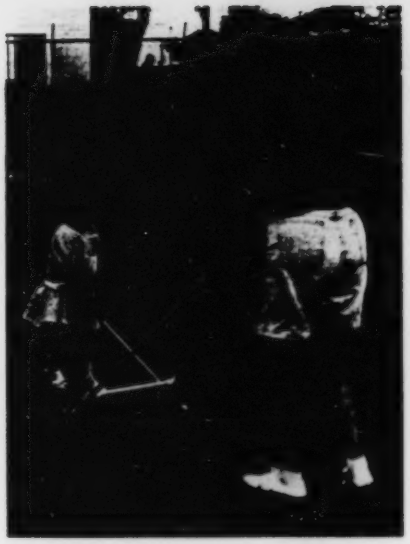
*I have found that Schedule 120 works fine; Schedule 40 is a bit heavier, but provides a more stable form if it is required.

Pre-Gluing Instructions

[1] Cut and label the PVC tubing into the following pieces:
- 40" Upper, long side bars (2 ea.)
- 6" Lower, short side bars (2 ea.)
- 10" Top cross bar (1 ea.)
- 16" Center cross bar (1 ea.)

These dimensions will position the student approximately 6' from the instructor and will provide a constant arc width of approximately 18".

[2] Construct the top section by placing an ELL joint onto each end of the top cross bar.

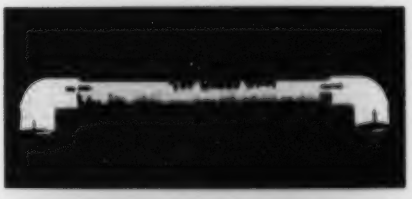


The instructor holds the device extended in front of her and walks backwards.

[3] Construct the center cross bar section by placing the single open sides of the TEE joints onto the center cross bar.

[4] Add the long side bars to the open end of the ELL joints. Then add the center cross bar section by placing the open side of the TEE joints onto the ends of the long side bars.

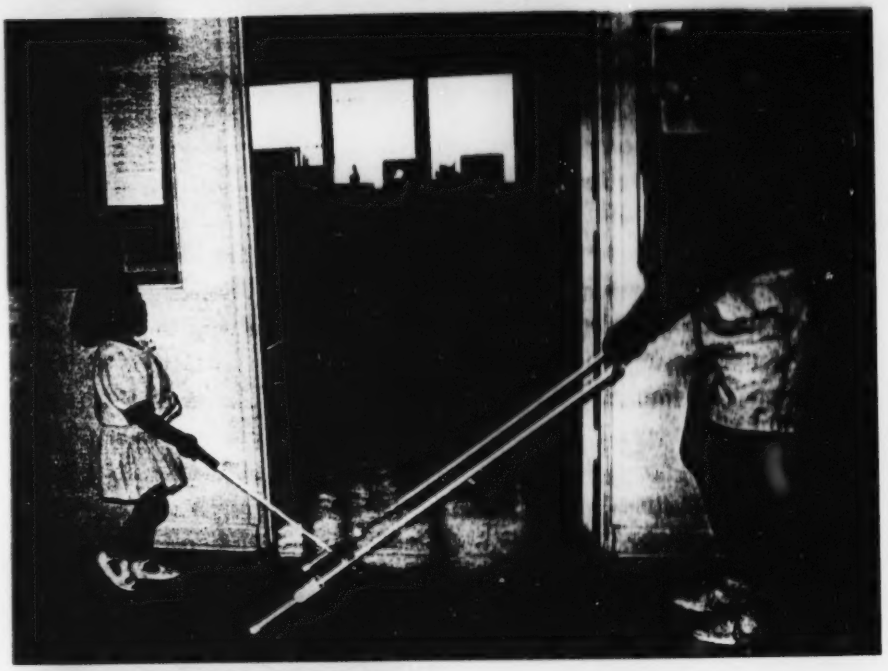
[5] Add the short side bars and place the end caps on them.



Step [2] Top section of the Arc-Definer.

Steps [3] and [5] The center section with the short side bars.

The Arc-Definer establishes enough physical distance between the student and the instructor to impart a sense of self-confidence in the child, without jeopardizing her safety.



Arc-Definer, Option #1: Fixed in size.

Gluing Instructions

Once you have adjusted the device so it is balanced and not lopsided, draw the appropriate match-up lines on both the tubing piece and the corresponding joints. Then dismantle and glue the device one section at a time until the device is complete. Follow the same sequence used in the "Pre-gluing Instructions" for instructions.

Option #2: Adjustable

This device is assembled in the same way as Option #1, except that it is made to be adjustable. As mentioned previously, the adjustable feature can be helpful if you need the device to teach students who have wide differences in arc width requirements.

You will need all the materials listed under Option #1, with the following changes: Instead of ½" Slip x Slip x Slip TEE joints, you will need two 1" Slip x Slip x Slip TEE joints. You will also need a 16" length of 1" thick, any Schedule, PVC tubing and 12" of ½" foam-type pipe insulation.

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Pre-gluing Instructions

[1] Cut and label the ½" PVC tubing into the following pieces:

- 48" Side bars (2 ea.)
- 10" Top cross bar (1 ea.)
- 16" Center cross bar; 1" thick PVC tubing (1 ea.)

These dimensions will position the student approximately 6' from the instructor and will provide an adjustable arc width of approximately 18" to 30".

[2] Construct the top section by placing an ELL joint onto each end of the top cross bar.

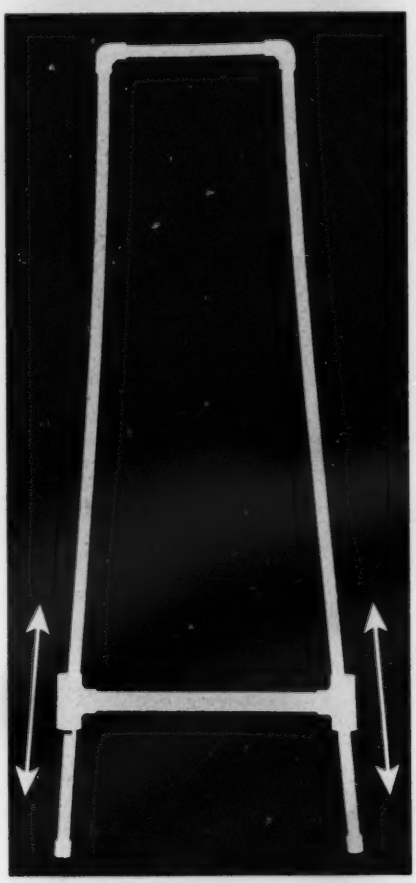
[3] The center cross bar section is created by first cutting a piece of insulation the length of the TEE joint and then cutting it in half vertically, creating a "boat" shape. The insulation is then placed inside of the "T" side of each of the TEE joints. Trim any insulation protruding from the joint. Place the center cross bar into the single open sides of the TEE joints.

[4] Carefully insert and push the open ends of the side bars into the TEE joint assemblies, being careful not to shift the insulation from the TEE joint. This center section will facilitate the adjustable action by the insulation material sliding up and down on the side bars. The higher you put it, the wider the arc becomes, and vice versa.

[5] Add the long side bars and place the end caps on them.

Step [3] Place the "boat" shaped foam into the TEE joint.

The center section assembled.



Arc-Definer, Option #2: Adjustable arc width.

CONCLUSION

It is my belief that we must have the same expectations for all children, regardless of any identified or unidentified disability. If we expect mediocre performance that's just what we will get.

Every child who is visually impaired has a basic right to stand on their own two feet, to walk, and to run. As service providers, we must demonstrate our confidence that these children can move about in their environment, just as their sighted peers. It is our responsibility to enable them to meet their goals, and to provide them with the tools that will allow them to function in a world designed for those who can see.

We must show them that they can move around freely and safely in the environment. We must show them that the world is a place in which to play, not a scary place where they bump their head and trip on things that seem to come out of nowhere. We must teach them the joys of mobility. So build and have fun. Show the children that life is not about sitting and being scared to move. Show them that they can zip through the playground with the wind on their smiling faces—safe, secure, and having the time of their lives.

Tiffany

Weighing just over one pound at birth, Tiffany was still very small when she began attending the Center at age two and a half. Tiffany was walking and had very good spatial skills. She was cautious and careful in her travels. She listened and was able to follow requests given to her. Tiffany demonstrated all the requisite skills necessary to starting long cane training, except one.

Due to prematurity, Tiffany had gross motor control issues. Because she was unable to control the movements of her arms, I was hesitant to start using a long cane with her. As with all children, I wanted her experience with the cane to be successful from the onset. I decided to start her with a Pusher.

From the time the Pusher was put into Tiffany's hands she was off exploring everything she could find. Within a couple of weeks she learned the concept of the device as an extension of her body. She found drop-offs, she found walls, she found people, she found doors. She could not find enough things with her new-found freedom. Tiffany quickly demonstrated the ability to be responsible with her device and therefore, got to keep it in her classroom. She never left the classroom without it.

Upon leaving the classroom, she would head straight for the place her Pusher was kept and upon returning,

Tiffany found drop-offs, she found walls, she found people, she found doors. She could not find enough things with her new found freedom.

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carefully replace it. Her O&M lessons focused on trailing, protective techniques, spatial skills, community outings with her Pusher, and development of long cane skills.

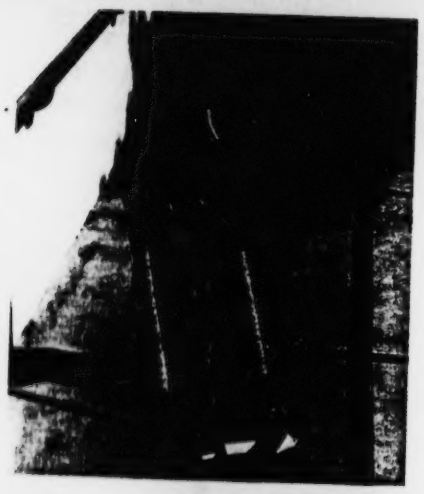
On Tiffany's first off-campus outing with the Pusher, she explored almost every square inch of the route! She had been using the device for a little over a month. The Center's students were walking to a park that was a half-mile away. She traveled the entire route completely independently—except for street crossings of course. She found driveways, curbs, parkways, parked cars, fences, and poles. Everything that could be found, Tiffany found it that day. The whole way there she was perfectly content and when she found things she had never been able to find on her own, a great big smile would spread across her face.

Tiffany's long cane skills were developing right along with her other mobility skills. On her 22" cane we added an L-Bar on the grip and a four-ounce weight near the tip. The L-Bar allowed her to use both hands on the cane, which helped her keep the tip on the ground and assisted her in keeping the cane in front of her body. The added weight further helped her keep the tip on the ground. We took the weight on and off several times during a lesson. This was to constantly remind her muscles of the difference in weight, so that they could exert the correct amount of energy in order to control the cane. If we had left the weight on all the time her muscles would acclimate to that particular weight, and if we took it off her muscles would become confused.

During this time, Tiffany was also receiving occupational therapy that was addressing her gross motor control issues. The added weight was only necessary for a couple of weeks. Tiffany quickly learned how to effectively keep the tip of her cane on the ground. She was very proud of herself. Although she enjoyed using her Pusher, she relished every opportunity to use her cane.

Tiffany is currently transitioning to the full-time use of a long cane and will soon no longer employ her Pusher.

Steven



Steven came to us as a two and a half year-old child who had received a severe head injury at eighteen months of age. Prior to the time of the injury, he was a typically developing child who had begun walking at twelve months of age. The doctors claimed "it was unfortunate, but he was hopeless, that he would remain in a semi-vegetative state for the rest of his life."

What we saw was a child who had a basic right to our earnest intervention. In the beginning, Steven didn't move. He sat slumped on the floor or in a chair, motionless, in a state of perpetual sadness. I decided to construct a MoveAbout for him that did not have casters so that it would remain stationary and he would feel secure holding onto it.

At first I had to fully support him when he was "standing" and holding onto the device. He would grasp the device with both hands and shake it and laugh. Pretty soon he was able to independently stand and support himself. Soon after that he was able to pull to a standing position using the device as a support.

As I observed him standing with the MoveAbout, I noticed definite movements in his legs. I considered the fact that he had been walking before his injury and that possibly the movements were indications that he remembered walking. I added front casters to the device and Steven began to push the device and move his feet in abbreviated stepping

Thrilled. Steven would relentlessly push his device all over the school...a feat his doctors claimed he would never be able to do.

motions. This gave him (and me!) great joy. Soon, I added rear casters, which Steven really liked. Because he was still not yet at the point where he could control the device on his own, I stood in front of him steadying the device at all times. Thrilled, Steven would relentlessly push the device all over the school. Soon he began to be able to steady the device himself, navigate with the device, and travel routes independently.

Soon after this he began to walk independently of the device; a feat his doctors claimed he would never be able to do. Not requiring the security and stability of a MoveAbout, we began to transition Steven to a Pusher.

Due to partial paralysis of his left side Steven had difficulty grasping the side of the device. It was at this time that the idea of attaching handles to the side bars came into play. The addition of the handles allowed him to hold the device in front of him and navigate the environment safely and efficiently. An added bonus of the handles was the supination (turning the arm/hand up) of the affected forearm and hand. This was necessary in order to encourage Steven to use his left hand and to keep his muscles stretched.

During Steven's last year at the Center, it was decided that we would transition him back to using an unmodified Pusher, as we felt it was important that he have as little adaptive equipment as necessary. The transition was slow and difficult, but once we started, Steven did not want to go back to the adaptive handles. The handles had enabled him to use his arm and hand and he was more adept at using the Pusher than when he first started using it. Initially, a nine-ounce weight had to be added to the left side that offered him a physical reminder to use his hand. But as time passed, we began taking the weight on and off. There were two reasons for this. One, we wanted him to be able to use the Pusher without the weight, and two, we wanted him to feel the difference between the weighted and unweighted device.

Currently, Steven is using the device without any added weight or other adaptive equipment. He travels routes in the school independently, runs freely outdoors, and is able to travel safely and efficiently.

CASE STUDIES

Kimberly

When Kimberly came to us as a frightened one and a half year-old, significantly fearful of moving in the environment, I knew I had a challenge on my hands.

She was clearly not being expected to do what her sighted peers were doing in terms of movement. It took a great deal of motivation to get Kimberly to even stand. She desperately clung to the people around her, and was very resistant to any type of independent movement.

Although she learned "trailing" quite quickly, she would only use it if an adult was holding her hand. Walking independently required a remarkable amount of effort, both for Kimberly and those around her. She was terrified of moving on her own.

When I had her use a push cart and observed that she was a bit more at ease, it became clear to me that Kimberly needed a device in front of her that was specific to her size, which she could push with little effort, maneuver with ease, and feel safe and protected. The creation of the MoveAbout was a result of developing a device that would meet Kimberly's needs. Initially, she was apprehensive about using the device. After a few sessions though, she miraculously began to want to use the device and would do so independently.

Kimberly contacted objects in her path, explored, navigated routes, detected drop-offs, indicated an understanding of the device as an extension of her body, and began to demonstrate a solid understanding of spatial concepts.

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Although she remained a very cautious traveller, she quickly learned how to use and manage the device with great proficiency. She began to do all the things necessary to build her travel skills and knowledge of the environment: she contacted objects in her path, explored, navigated routes, detected drop-offs, indicated an understanding of the device as an extension of her body, and began to demonstrate a solid understanding of spatial concepts.

As she became more and more comfortable in her travel experiences, she demonstrated the need for a less cumbersome, less protective device by the casual way in which she employed the MoveAbout. It was at this point that she was then formally transitioned to a Pusher.

Because she had a clear understanding of the environment and was comfortable moving in it, she readily took and used the new device. The top cross bar of her Pusher was covered in insulating foam in order to keep her from holding on to it. She almost instantly learned the proper side hand placement, which would later aid in a smooth transition to proper long cane grip and position. She was able to retrieve and correctly position the device without assistance. In the meantime, Kimberly was able to relax and trust her movement and learn about her environment by exploring it while feeling safe. This lead to more refined trailing skills, the ability to learn and employ protective techniques, and to independently follow familiar travel routes.

Once again, Kimberly's eventual casual employment of the Pusher indicated that she was ready for formal introduction to the long cane. Although she had had incidental contact with the long cane and had used it during "play" on previous occasions, she had never been expected to use it as a travel tool. The day I presented Kimberly with a long cane was one of pure joy and satisfaction. She immediately placed the grip of the cane in her hand and extended the cane out in front of her body. She walked forward, contacted the door with the tip of the cane, and reached out with her free hand to explore what she had found with her cane. As we opened the door, she stepped out into the beautiful, wide-open outdoors, and with a great big smile on her face found the step down with her cane and was off to explore.

From the first day Kimberly had the long cane, it made sense to her: she knew to keep it in front of her body, she knew to keep the tip on the ground, she knew it would find things in her path—she knew it would keep her safe. This, i earnestly believe, is because she had been using devices that were not only appropriate to her needs, but devices that also taught her about the environment and that she could be safe in it, prior to formal introduction to the long cane.

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ACKNOWLEDGEMENTS

Standing on my own two feet: A step-by-step guide to designing and constructing simple, individually tailored adaptive mobility devices for preschool-age children who are visually impaired was developed as a result of the response and interest generated by professional presentations given by our Orientation & Mobility instructor, Lorie Lynn LaPrelle, M.A. The principles involved are universal; however, the personalized design and the ease of construction of the devices are the result of Lorie Lynn's keen observation and creativity.

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Midge Horton
Executive Director
Blind Childrens Center

BLIND CHILDRENS CENTER

The Blind Childrens Center offers a program of diversified services which meets the special needs of children who are blind, visually impaired, and multi-handicapped blind (ages birth through five years), their parents, and siblings at no charge. Services include: Infant Stimulation Program; Educational Preschool; Family Support Services; Information & Referral Program; Toll Free National Phone Line; Research Program; and Internship Opportunities. Publications are produced regularly for parents and professionals.

A non-profit organization, the Blind Childrens Center is available to children who are blind and partially sighted regardless of race, color, national or ethnic origin, sex, or religion. Founded in 1938, the Center is a project of the Southern California Delta Gammas. The Blind Childrens Center operates without state or federal assistance.

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